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HIP FRACTURES IN FINLAND – A COMPARISON OF PATIENT CHARACTERISTICS AND OUTCOMES IN SIX HOSPITALS

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ABSTRACT

Background and Aims: **To compare six Finnish hospitals for the quality of treatment of hip fractures and to obtain information for the development of care.**

Material and Methods: **Data of 1179 consecutive hip fracture patients (about 200 patients per hospital) was collected prospectively, using similar standardized forms and focusing on background factors and the four-month functional outcome.**

Results: **There were significant differences between the hospitals in patient characteristics (age, place of residence, walking ability, use of walking aids, morbidity and type of fracture) and in the unadjusted outcome variables at four months' follow-up (place of residence, mobility, use of walking aids and pain in injured hip). After adjustment for baseline characteristics, there was a significant difference in the post-fracture walking ability between the centres but no significant differences in post-fracture place of residence. Unadjusted mortality did not vary between the centres, but adjustment resulted in significant differences. The most marked difference in surgical methods between the hospitals was seen in the use of either sliding hip screw or Gamma Nail for trochanteric fractures, but this difference was not reflected in the results of multivariate analysis.**

Conclusions: **We found minor differences in mobility and mortality between the participating hospitals, and these might serve them as a stimulus for improving their standard of good practice. Continuous quality improvement by repeating the audit cycle is recommended in order to reach and then improve the prevalent standards in the care of hip fracture patients. Confounding factors should be adjusted when comparing the medical centres treating hip fractures, and the evaluation of the results should be multidimensional.**

Key words: Hip fractures; treatment outcome; mortality; hospitalisation; locomotion; prospective studies; survival analysis; outcome assessment (health care)

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TABLE 1

Data prior to fracture.

Center	Joensuu		Kajaani		Kemi		Kokkola		Oulu		Rovaniemi		P-value
Number of patients	187		199		192		190		213		198		
Gender													0.055
Male	50	27 %	45	23 %	68	35 %	58	31 %	52	24 %	61	31 %	
Female	137	73 %	154	77 %	124	65 %	132	69 %	161	76 %	137	69 %	
Place of residence at fracture													< 0.001
Own home	99	53 %	134	67 %	119	62 %	94	49 %	126	59 %	116	59 %	
Sheltered housing	13	7 %	11	6 %	17	9 %	14	7 %	7	3 %	14	7 %	
Old people's home	42	22 %	35	18 %	42	22 %	54	28 %	54	25 %	56	28 %	
Permanent health centre hospital inpatient	18	10 %	4	2 %	7	4 %	6	3 %	15	7 %	8	4 %	
Rehabilitation unit	6	3 %	1	1 %					1	0 %			
Acute hospital (health centre or other)	9	5 %	14	7 %	7	4 %	22	12 %	9	4 %	3	2 %	
Lived alone													< 0.001
No	116	62 %	121	61 %	109	57 %	138	73 %	139	65 %	151	76 %	
Yes	71	38 %	78	39 %	83	43 %	52	27 %	74	35 %	47	24 %	
Walking ability													0.026
Alone out of doors	89	48 %	90	45 %	103	54 %	98	52 %	121	57 %	108	55 %	
Out of doors only accompanied	10	5 %	20	10 %	22	12 %	11	6 %	16	8 %	19	10 %	
Alone indoors, not out of doors	69	37 %	54	27 %	49	26 %	58	31 %	55	26 %	54	27 %	
Indoors only accompanied	14	7 %	30	15 %	14	7 %	16	8 %	20	9 %	14	7 %	
Unable to walk	5	3 %	5	3 %	2	1 %	7	4 %	1	1 %	3	2 %	
Use of walking aids													0.014
Can walk without aids	105	56 %	118	59 %	111	59 %	96	51 %	94	44 %	95	48 %	
One stick	28	15 %	31	16 %	24	13 %	20	11 %	25	12 %	28	14 %	
Two sticks	6	3 %	4	2 %	5	3 %	3	2 %	2	1 %	3	2 %	
Walking frame	43	23 %	40	20 %	44	23 %	62	33 %	83	39 %	67	34 %	
Wheelchair	4	2 %	6	3 %	4	2 %	9	5 %	9	4 %	5	3 %	
ASA grade													< 0.001
I	5	3 %	2	1 %	16	9 %	3	2 %	3	1 %	7	4 %	
II	19	10 %	18	9 %	51	27 %	29	16 %	25	12 %	43	22 %	
III	110	60 %	112	57 %	82	44 %	121	67 %	139	67 %	117	59 %	
IV	48	26 %	62	31 %	39	21 %	27	15 %	39	19 %	30	15 %	
V	2	1 %	4	2 %			1	1 %					
Age (years)													0.025
Mean		78.4		80.7		78.7		78.8		78.7		78.2	
Range		51.3–99.3		56.7–99.4		50.3–99.0		50.5–95.5		53.1–102.4		52.4-98.7	

INTRODUCTION

Hip fracture is the most common reason for an elderly person to be admitted into an acute orthopaedic ward and the most resource-demanding condition of orthopaedic and trauma units. Therefore, development of treatment and rehabilitation is important from the clinical and socio-economic points of view. Knowledge for quality analysis and further development of treatment can be obtained by comparing treatment routines and the results of different hospitals using similar standardized audits.

There are some studies of this kind evaluating the differences in hip fracture treatment between different countries and within a single country (1–9). Some of them have been conducted using conventional direct comparisons without any sophisticated statistical methods. However, most of these studies have been carried out with care, and they have demonstrated the importance of multivariate analyses and multidimensional evaluations (3, 4, 7–9).

The aim of this study was to compare the hip fracture treatments provided in five central hospitals and one university hospital for quality control and to obtain information for the development of the treatment of hip fractures.

MATERIAL AND METHODS

Data on about 200 consecutive hip fracture patients aged 50 years or over were collected between August 1997 and February 2001 in 6 hospitals in Finland: Joensuu (catchment area with 172 500 inhabitants), Kajaani (91 000), Kemi (70 000), Kokkola (78 000), Rovaniemi (121 500) and Oulu (360 000). Data collection time varied due to differences in cathcment populations. The first five hospitals are central hospitals providing special health care for the people living in their catchment areas. Oulu University Hospital serves as a central hospital for its primary catchment area and also provides highly specialized care for the whole of Northern Finland.

In every participating hospital the data was collected using standardized hip fracture study forms (SAHFE, Standardised Audit of Hip Fractures in Europe) (10). The

TABLE 2

Data of fracture and treatment.

Center	Joensuu		Kajaani		Kemi		Kokkola		Oulu		Rovaniemi		P-value
Side of fracture													0,303
Left	88	47 %	86	43 %	96	50 %	92	48 %	117	55 %	97	49 %	
Right	99	53 %	113	57 %	96	50 %	98	52 %	96	45 %	101	51 %	
Type of fracture													< 0.001
Undisplaced cervical	36	19 %	44	22 %	53	29 %	36	19 %	20	9 %	37	19 %	
Displaced cervical	71	38 %	67	34 %	58	31 %	65	35 %	116	54 %	87	44 %	
Basicervical	7	4 %	14	7 %	7	4 %	19	10 %	6	3 %	16	8 %	
Trochanteric two-fragment	31	17 %	37	19 %	43	23 %	29	15 %	29	14 %	32	16 %	
Trochanteric multifragment	30	16 %	26	13 %	16	9 %	23	12 %	39	18 %	23	12 %	
Subtrochanteric	12	6 %	11	6 %	8	4 %	16	9 %	3	1 %	3	2 %	
Delay of operation (days)													< 0.001
Mean		1.82		1.12		2.08		1.91		1.48		1.84	
Range		0–15		0–23		0–33		0–33		0–13		0–18	
Method of treatment													
Cervical													< 0.001
Osteosynthesis	25	23 %	39	35 %	35	32 %	17	17 %	32	24 %	26	21 %	
Hemiarthroplasty	77	72 %	66	59 %	64	58 %	81	80 %	90	66 %	80	65 %	
Total hip arthroplasty	1	1 %	5	5 %	9	8 %	1	1 %	10	7 %	14	11 %	
Girdlestone	1	1 %			3	3 %			1	1 %	3	2 %	
Not operated	3	3 %	1	1 %			2	2 %	3	2 %	1	1 %	
Basicervical													< 0.001
Osteosynthesis			1	7 %	2	29 %	2	11 %	1	17 %	2	13 %	
Sliding hip screw	5	71 %	9	64 %	2	29 %	4	21 %			4	25 %	
Gamma Nail									5	83 %	4	25 %	
Hemiarthroplasty	1	14 %	4	29 %	3	43 %	13	68 %			6	38 %	
Girdlestone	1	14 %											
Not operated													
Trochanteric *													< 0.001
Sliding hip screw	61	84 %	71	96 %	45	67 %	48	73 %	12	17 %	23	40 %	
Gamma Nail	5	7 %			10	15 %	9	14 %	57	80 %	30	53 %	
Hemiarthroplasty	3	4 %	3	4 %	9	13 %	5	8 %			3	5 %	
Total hip arthroplasty					1	1 %			1	1 %			
Girdlestone	4	5 %			2	3 %	1	2 %			1	2 %	
Not operated							3	5 %	1	1 %			
Discharged to													< 0.001
Own home	8	4 %	4	2 %	18	9 %	7	4 %	9	4 %	12	6 %	
Sheltered housing					2	1 %					1	1 %	
Old people's home			2	1 %	1	1 %	3	2 %	4	2 %	2	1 %	
Permanent health center													
Hospital inpatient	13	7 %	3	2 %	16	8 %	5	3 %	10	5 %	24	12 %	
Rehabilitation unit	1	1 %			1	1 %			88	41 %	9	5 %	
Acute hospital (health centre or other)	162	87 %	188	94 %	152	79 %	173	91 %	96	45 %	145	73 %	
Died	3	2 %	2	1 %	2	1 %	2	1 %	6	3 %	5	3 %	
Hospital stay (days)													< 0.001
Mean		6.8		4.8		9.3		5.5		7.1		7.8	
Median		5		4		7		5		6		6	
Range		1–36		1–32		1–38		0–35		2–64		0–33	

* Includes also subtrochanteric

collection was performed by nurses specially trained for the use of these forms. On admission, the nurse registered information about the patient, the fracture and the treatment, such as age, sex, place of residence, walking ability, use of walking aids, side and type of fracture, morbidity classified for ASA grade (11), the surgical method used and the place of discharge (Tables 1 and 2). The follow-up assessment was carried out four months after the fracture. Information on the patient's residential status during the first postoperative four months, walking ability, use of walking aids, pain in the hip and reoperations was registered using forms filled in by the patients and completed, if necessary, by the nurse during a telephone interview (Table 3). Mortality data were obtained from Finnish Census Register. The ethical committees of every hospital and the University of Oulu approved the study protocol. Informed consent was obtained from the patients.

All data from the participating hospitals were computerized, merged and analyzed by a statistician using the SPSS statistical software (SPSS 11.5 for Windows). Pathologic fractures were excluded. Chi-square test was performed for categorical variables and Kruskal-Wallis test for continuous variables to obtain statistical significances. The Kaplan-Meier estimates of survival curves were compared by the log rank test. Cox regression analysis was used to compare survival rates between the centres adjusted for confounding factors. The forward stepwise method was used with indicator contrast. Logistic regression analysis

TABLE 3

Four months follow-up.

Center	Joensuu		Kajaani		Kemi		Kokkola		Oulu		Rovaniemi		P-value
Residential status													< 0.001
Own home	68	36 %	83	42 %	86	46 %	63	34 %	91	43 %	88	44 %	
Sheltered housing	8	4 %	13	7 %	7	4 %	9	5 %	10	5 %	6	3 %	
Old people's home	32	17 %	41	21 %	25	13 %	49	26 %	35	17 %	36	18 %	
Permanent health centre													
Hospital inpatient	45	24 %	20	10 %	21	11 %	21	11 %	28	13 %	24	12 %	
Acute hospital (health centre or other)	12	6 %	9	5 %	17	9 %	6	3 %	7	3 %	7	4 %	
Died	22	12 %	33	17 %	32	17 %	38	20 %	41	19 %	37	19 %	
Walking ability													0.003
Alone out of doors	53	32 %	33	19 %	51	31 %	50	29 %	58	33 %	48	28 %	
Out of doors only accompanied	6	4 %	22	13 %	17	10 %	6	4 %	15	9 %	15	9 %	
Alone indoors, not out of doors	35	21 %	43	25 %	42	26 %	37	22 %	43	25 %	39	23 %	
Indoors only accompanied	38	23 %	53	30 %	32	20 %	40	24 %	42	24 %	41	24 %	
Unable to walk	35	21 %	24	14 %	20	12 %	37	22 %	16	9 %	27	16 %	
Use of walking aids													0.002
Can walk without aids	27	16 %	19	11 %	25	16 %	21	12 %	20	12 %	21	12 %	
One stick	30	18 %	26	15 %	20	13 %	18	11 %	26	15 %	22	13 %	
Two sticks	9	5 %	14	8 %	11	7 %	7	4 %	6	3 %	18	10 %	
Walking frame	60	36 %	90	51 %	77	49 %	82	48 %	101	59 %	73	42 %	
Wheelchair/Bedbound	41	25 %	26	15 %	25	16 %	43	25 %	19	11 %	38	22 %	
Pain in injured hip													0.001
Yes, quite a lot	14	10 %	11	7 %	10	7 %	8	5 %	16	10 %	15	10 %	
Yes, a little	66	46 %	80	51 %	80	53 %	89	60 %	97	63 %	95	63 %	
No, not at all	64	44 %	66	42 %	60	40 %	51	34 %	42	27 %	42	28 %	
Mortality													
4 months	22	12 %	33	17 %	32	17 %	38	20 %	41	19 %	37	19 %	0.311
12 months	42	23 %	49	25 %	51	27 %	50	26 %	63	30 %	56	28 %	0.715
Re-operations													
Removal of implant	2	11 %	2	14 %	2	11 %	1	6 %	2	10 %	2	10 %	
Hemiarthroplasty	2	11 %	1	7 %			1	6 %	2	10 %	1	5 %	
Total hip arthroplasty	2	11 %	1	7 %	7	37 %			4	20 %	2	10 %	
Reosteosynthesis	4	22 %	2	14 %	3	16 %	6	35 %	6	30 %	2	10 %	
Girdlestone					2	11 %							
Drainage of haemathoma or infection			2	14 %			1	6 %			1	5 %	
Reduction of dislocation	5	28 %	5	36 %	1	5 %	2	12 %	4	20 %	1	5 %	
Other	3	17 %	1	7 %	4	21 %	6	35 %	2	10 %	9	45 %	
Reoperation rate	18	10 %	14	7 %	19	10 %	17	9 %	20	9 %	20	10 %	0.914

was used to compare postoperative walking ability and residence between the centres using the forward stepwise method. The preoperative variables used in all multivariate analyses were centre, age, sex, residence, walking ability, morbidity, side and type of fracture, delay of operation, method of treatment and length of stay in primary hospital.

RESULTS

There were statistically significant differences between the hospitals in the patient characteristics prior to admission (Tables 1 and 2). In Kajaani, the patients were somewhat older and lived more often at their own homes than in the other localities. The proportions of male patients and patients living together with someone were highest in Kemi. The patients in Oulu had the best walking ability, but they also used walking aids most often. In Kemi, there were more healthy patients, i.e. categorized as ASA I or II, than in the other hospitals.

The delay from admission to operation was shortest in Kajaani, 1.12 days on an average (Table 2). The majority of fractures, around 60 %, were cervical, and hemiarthroplasty was applied in most of these cases in all hospitals. For trochanteric fractures, Joensuu and Kajaani used almost exclusively sliding hip screw, while Gamma Nail was the treatment of choice in Oulu. Notably fewer of the fractures were classified as basicervical in Oulu and Kemi than in the other hospitals.

The mean time spent in primary hospital varied significantly, being shortest in Kajaani and longest in Kemi (Table 2). Longer hospitalization times resulted in higher rates of discharge directly into patients' own homes.

There were also statistically significant differences in most outcome variables at four months after the fracture (Table 3). The proportion of patients able to return to their own homes from the primary hospital was highest in Kemi. Patients regained their walking ability most often in Oulu, where nearly a twofold number of patients were able to walk alone out-

TABLE 4

Logistic regression analysis. Outcome variable: unable to walk alone outdoors at four months.

	Crude			Adjusted			
Variable	OR	95% CI		OR	95% CI		p-value to remove
Age	1.10	1.08	1.12	1.08	1.05	1.099	< 0.001
Place of living at fracture							0.001
Own home	1.00			1.00			
Sheltered housing	0.80	0.46	1.38	0.48	0.25	0.92	
Old people's home	10.7	5.84	19.6	3.77	1.86	7.66	
Permanent health centre hospital inpatient	8.51	2.60	27.9	1.57	0.39	6.28	
Rehabilitation unit	4.03	0.48	33.7	1.71	0.15	19.8	
Acute hospital (health centre or other)	8.51	2.60	27.9	2.79	0.72	19.8	
Walking ability prior to fracture							< 0.001
Alone out of doors	1.00			1.00			
Out of doors only accompanied	14.4	5.75	36.3	9.21	3.50	24.2	
Alone indoors, not out of doors	15.9	9.03	28.0	7.47	4.02	13.9	
Indoors only accompanied	77.1	10.7	559	30.7	4.01	235	
Unable to walk	–			–			
ASA category							< 0.001
I	1.00			1.00			
II	4.40	1.74	11.1	2.76	0.93	8.21	
III	14.3	5.80	35.1	4.97	1.70	14.5	
IV	31.5	11.8	84.2	8.7	2.71	27.7	
V	–			–			
Center							0.082
Joensuu	1.00			1.00			
Kajaani	1.89	1.15	3.13	2.12	1.12	3.99	
Kemi	0.97	0.61	1.56	1.56	0.83	2.95	
Kokkola	0.93	0.58	1.49	1.18	0.61	2.26	
Oulu	0.92	0.59	1.45	1.10	0.61	1.99	
Rovaniemi	1.12	0.70	1.79	1.94	1.05	3.58	
Length of stay in primary hospital	1.03	1.01	1.06	1.04	1.01	1.08	0.018

doors compared to Kajaani. On the other hand, the use of walking aids, especially walking frame, was more common in Oulu than in the other centres. The number of patients with no pain in the involved hip also varied markedly between the hospitals, with Oulu displaying the lowest percentage (27 %) and Joensuu the highest (44 %). No significant differences were observed in the reoperation rate between the hospitals; the rate varied from 5 to 7 %.

In logistic regression analysis, preoperative residence, walking ability, morbidity, age and length of stay in the primary hospital were predictive of walking ability at four months (Table 4). Centre as a covariate did not significantly improve the model, but it was entered to demonstrate any possible differences between the hospitals. However, the patients treated in Kajaani and Rovaniemi ultimately had a slightly poorer postoperative walking ability.

According to the logistic regression analysis, preoperative residence, walking ability, morbidity and age were predictive of residential status at four months (Table 5). The hospitals were entered into the model, but no significant differences were observed between them.

Figure 1 shows the estimated mortality data of the centres. The difference in mortality between the centres was statistically non-significant according to a log rank test (p = 0.567). In Cox regression analysis, age, sex, walking ability and morbidity prior to fracture were associated with the risk of death (Table 6). Centre as a covariate did not significantly improve the model, but was entered into the model to demonstrate the slight differences in mortality between the hospitals. This analysis showed slightly higher mortality in Oulu and Rovaniemi.

DISCUSSION

Initially, we found no differences in unadjusted mortality between the centres, but when the background factors were considered, minor differences were detected. Moreover, there were differences between the centres in the unadjusted postoperative place of residence, but after risk adjustment, the differences turned out to be statistically non-significant. Therefore, a comparison between medical centres with regard to the treatment of hip fractures requires risk adjustment (3, 5, 7–9).

It has been shown that good hospital performance in one outcome is not necessarily related to good performance on another when treating hip fractures (4, 7). Also here, one of the participating hospitals had a low risk-adjusted mortality rate but less good outcomes in risk-adjusted mobility. In addition, another hospital had good results in risk-adjusted mo-

TABLE 5

Logistic regression analysis. Outcome variable: not living at own home at four months.

Variable	Crude			Adjusted			p-value to remove
	OR	95% CI		OR	95% CI		
Age	1.07	1.06	1.09	1.04	1.02	1.07	<0.001
Place of living at fracture							< 0.001
Own home	1.00			1.00			
Sheltered housing	21.6	9.59	48.5	22.1	9.53	51.4	
Old people's home	148	54.1	405	101	35.6	286	
Permanent health centre hospital inpatient	57.7	13.8	242	25.9	5.81	115	
Rehabilitation unit	–			–			
Acute hospital (health centre or other)	14.8	6.44	34.0	9.58	3.59	25.5	
Walking ability prior to fracture							<0.001
Alone out of doors	1.00			1.00			
Out of doors only accompanied	3.15	1.94	5.11	1.63	0.85	3.13	
Alone indoors, not out of doors	8.78	6.12	12.6	3.33	2.09	5.24	
Indoors only accompanied	13.3	7.00	25.2	2.08	0.84	5.16	
Unable to walk	19.6	4.48	85.9	4.07	0.63	26.3	
ASA category							< 0.001
I	1.00			1.00			
II	2.34	0.86	6.39	0.90	0.27	2.99	
III	7.31	2.80	19.1	1.75	0.56	5.52	
IV	11.3	4.17	30.6	2.71	0.82	9.0	
V	–			–			
Center							0.674
Joensuu	1.00			1.00			
Kajaani	1.74	1.12	2.71	0.88	0.47	1.62	
Kemi	1.22	0.79	1.89	0.97	0.50	1.85	
Kokkola	1.00	0.64	1.55	1.13	0.57	2.23	
Oulu	1.65	1.05	2.59	0.70	0.37	1.33	
Rovaniemi	1.07	0.70	1.66	0.71	0.36	1.39	

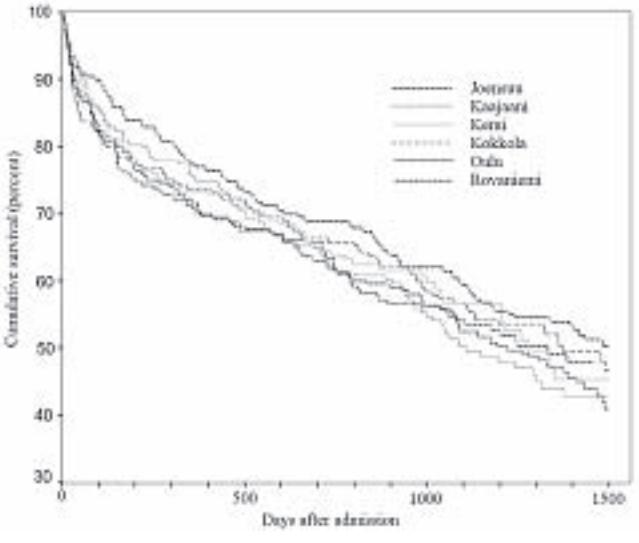

Fig. 1. Kaplan-Meier survival curve for the six centers.

bility but a higher risk-adjusted mortality rate. This emphasizes the importance of multidimensional evaluation (4, 7, 8).

We did not find any major differences in the outcome between the hospitals. This shows that the quality of care is quite similar in them. In this respect,

TABLE 6

Cox regression analysis. Relative risk of mortality.

Variable	RR	95% CI	p-value to remove
Age	1.06	1.04–1.07	< 0.001
Sex			< 0.001
Male	1.00		
Female	0.58	0.48–0.68	
Walking ability prior to fracture			< 0.001
Alone out of doors	1.00		
Out of doors only accompanied	1.37	1.01–1.87	
Alone indoors, not out of doors	1.67	1.37–2.04	
Indoors only accompanied	1.72	1.31–2.27	
Unable to walk	1.97	1.13–3.42	
ASA category			< 0.001
I	1.00		
II	1.67	0.66–4.21	
III	2.65	1.08–6.49	
IV	4.13	1.67–10.2	
V	4.36	1.29–14.7	
Center			0.058
Joensuu	1.00		
Kajaani	1.08	0.82–1.44	
Kemi	1.30	0.96–1.77	
Kokkola	1.00	0.74–1.35	
Oulu	1.37	1.03–1.81	
Rovaniemi	1.38	1.03–1.84	

the results were approximately as anticipated. Anyhow, there were minor but statistically significant differences in adjusted postoperative mobility and mortality. No single factor or aspect of practice that would explain these differences could be defined, and there are many explanations for the differences in hospital performance. It is possible that our models did not fully adjust for the differences in the patients' background factors, i.e. there may have been some important risk factors that went unrecorded. This is not, however, probable as we used many variables shown earlier to be predictive of functional outcome and mortality after hip fracture, such as age, sex, preoperative place of residence, mobility and morbidity (1–4, 7–9). Therefore, we believe that the differences observed in outcome reflect real variation in the quality of care between the hospitals and are, doubtless, due to the cumulative effects of several aspects of the treatment and management of hip fractures, as also noted by Todd et al. (9). However, these differences may facilitate the further development of treatment in the units involved.

It should be emphasized that our result are affected by the quality of care of the whole treatment chain, including the rehabilitation units, health centre hospitals, convalescent homes and geriatric departments, rather than merely by the quality of the primary hospitals. However, this bias is potentially present in any long-term outcome study on trauma patients.

The major difference in treatment was seen in the surgical methods applied to trochanteric fractures. Two hospitals used almost exclusively sliding hip screws, while one preferred Gamma Nail. This difference was not reflected in the results according to multivariate analysis, indicating that these methods are fairly equal with regard to functional outcome.

We found in the literature nine studies that compared medical centres treating hip fractures of the elderly, five of which applied multivariate methods of analysis (1–7, 8, 9). Most of them, especially the most recent studies, reported quite similar outcomes of hip fracture treatment in different centres in the western countries, irrespective of the choices concerning the surgical methods and rehabilitation, but there were also minor differences, which might be important for the improvement of the quality of treatment. They also emphasize that adjustment for risk factors is essential, and that the functional outcome should be considered in addition to mortality, as it was also recommended here. All of these studies have concentrated on the effects of background factors and in-hospital care on the outcome, ignoring the postoperative care and rehabilitation carried out in various institutions. There is a demand for surveys evaluating the impact of different rehabilitation methods on the outcome (4, 8).

In conclusion, we found minor but significant differences in mobility and mortality between the hospitals involved. These might serve as a stimulus for the improvement of their standard of good practice. Continuous quality improvement by repeating the audit cycle is recommended in order to reach and then improve the prevalent standards of care of hip fracture patients. Confounding factors should be adjusted when comparing medical centres treating hip fractures, and the evaluation of the results should be multidimensional. More information about the postoperative rehabilitation methods and their efficacy is needed.

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